

FROST ASSOCIATES

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Sub: Covitch Property/ Former ATF Davidson Co
Northbridge, MA

CERCLIS: MAD046128559

Job: 11098-001-001-1162-99

TDD: 95-07-0065

Site Longitude: 71-40-34 71.676109
Site Latitude : 42-06-34.5 42.109581

The CENTRACTS report below identifies the population, households, and private water wells of each Block Group that lies within, or partially within, the .4, .3, .2, .1, .05, and .25, mile "rings" of the latitude and longitude coordinates above. CENTRACTS may have up to ten radii of any length. 1000 block groups, and 15000 block group sides.

CENTRACTS uses the 1990 Block Group population and Block Group house count data found in the Census Bureau's 1990 STF-1A files. The sources of water supply data are from the Bureau's 1990 STF-3A files. The boundary line coordinates of the Block Groups were extracted from the Census Bureau's 1990 TIGER/Line Files.

CENTRACTS reports are created with programs written by Frost Associates, P.O. Box 495, Essex, Conn. The code was written using Microsoft's Quick-Basic Ver. 4.5.

Latitude and Longitude coordinates identifying a site are entered in degrees and decimal degrees. One or more county files holding Block Group boundary lines are selected for use by CENTRACTS by determining whether the site coordinates fall within the minimum and maximum Lat\Lon coordinates of each county in the state.

Each Block Group line segment has Lat\Lon coordinates representing the "From" and "To" ends of that line. All coordinates from the selected county files are read and converted from degrees, decimal degrees to X\Y miles from the site location. Each line segment is then examined whether it lies within or partially within the maximum ring from the site.

The unique Block Group ID numbers of each line segment that lie within the maximum ring are retained. All Block Group boundary lines matching the Block Group numbers are then extracted from the respective county files to obtain all sides of the in-

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cluded Block Groups. Boundary records are then sorted in adjacent side order to determine the shape and area of each Block Group polygon.

A method to solve for the area of a polygon is to take one-half the sum of the products obtained by multiplying each X-coordinate by the difference between the adjacent Y-coordinates. For a polygon with coordinates at adjacent angles A, B, C, D, and E. The formula can be expressed:

$$\text{Area} = 1/2\{X_a(Y_e - Y_b) + X_b(Y_a - Y_c) + X_c(Y_b - Y_d) + X_d(Y_c - Y_e) + X_e(Y_d - Y_a)\}$$

For each ring, the selected Block Groups will be inside, outside, or intersected by the ring. When a polygon is intersected, the partial Block Group area within that ring is calculated using the method described below.

When a ring intersects a Block Group, the intersect points are solved and plotted at the points where the ring enters and exits the shape. The chord line, a line within the circle connecting the intersect points is determined. This chord line is used to calculate the segment area, the half moon shape between the chord line and the ring, and the sub-polygon created by the chord line and the Block Group boundaries that lie outside the ring.

The segment area is subtracted from the sub-polygon area to determine the area of the sub-polygon outside the ring. The area outside the ring is then subtracted from the area of the entire polygon to arrive at the inside area. This inside area is then divided by the tract's total area to determine the percentage of area within the ring. This process is repeated for each block group that is intersected by one of the rings. The total area, partial area, and percentage of partial area of those block groups within, or partially within a ring, are held in memory for the report.

On occasion, the algorithm described above is unable to determine the area of the partial area. Within the report program is a "Paint" routine which allows an enclosed shape to be highlighted. Another routine calculates the percentage of highlighted screen pixels to the pixels within the polygon. A manual entry is allowed. Both the "paint" method and manual entry method over ride the calculated method.

CENTRACTS lists, starting on page 4, all Block Groups in State, County, Census Tract, and Block Group ID order that lie within, or partially within, the maximum ring. Each Block Group is identified by a City or Town name and by the Block Group's State, County, Tract and Block Group ID number. Following is the Block Group's 1990 population and house count extracted from the Census Bureau's 1990 STF-1A files.

The next four columns display water source data from the 1990 STF-3A files. The first column is "Units with Public system or private company source of water", followed by "Units with individual well, Drilled, source of water"; "Units with individual well, Dug, source of water" and "Units with Other source of water".

For each ring, CENTRACTS then shows the Block Groups that are within that ring, the Block Group's total area in square miles, the partial area of the Block Group within that ring, and the partial percentage within the ring. The areas of the included Block Group and the partial areas are then totaled.

The last section tallies the demographic data within each ring. The percentage of area for each Block Group is multiplied times the census data for that Block Group and totaled for all Block Group's within the ring. Ring totals are then determined by subtracting the three mile data from the four mile, the two mile from the three mile, one from the two, etc... Population on private wells is calculated using the formula: ((Drilled + Dug Wells) / Households) * Population

Covitch Property/ Former ATF Davidson Co
Northbridge, MA

No.	City	Block Group	Blk ID	Grp People	House Holds	Public Water	Drilled Wells	Dug Wells	Other
1	Grafton	25027	7381	2	1165	448	419	15	5
2	Grafton	25027	7381	9	437	193	120	63	8
3	Upton	25027	7431	4	770	298	73	179	39
4	Uxbridge	25027	7491	1	1050	344	39	231	59
5	Uxbridge	25027	7491	2	2590	968	827	160	20
6	Uxbridge	25027	7491	3	572	206	46	128	28
7	Uxbridge	25027	7491	4	848	275	0	243	6
8	Uxbridge	25027	7492	1	1341	531	508	8	10
9	Uxbridge	25027	7492	2	1435	666	650	0	0
10	Uxbridge	25027	7492	3	2568	970	949	45	0
11	Northbridge	25027	7501	1	810	362	363	6	0
12	Northbridge	25027	7501	2	2753	966	969	9	0
13	Northbridge	25027	7501	3	1620	669	660	10	0
14	Northbridge	25027	7502	1	296	100	82	0	0
15	Northbridge	25027	7502	2	210	65	50	13	0
16	Northbridge	25027	7502	3	1680	734	733	29	7
17	Northbridge	25027	7502	4	396	137	14	105	12
18	Northbridge	25027	7502	5	245	98	80	14	6
19	Northbridge	25027	7502	6	843	305	271	10	8
20	Northbridge	25027	7502	7	1517	494	255	188	38
21	Northbridge	25027	7502	8	160	65	63	0	0
22	Northbridge	25027	7503	1	2841	1018	936	68	14
23	Sutton	25027	7511	1	648	211	37	159	0
24	Sutton	25027	7511	3	1887	669	214	399	56
25	Sutton	25027	7511	4	2043	734	412	259	40
26	Sutton	25027	7511	9	1039	409	17	353	31
27	Douglas	25027	7521	1	1438	492	185	290	8
28	Douglas	25027	7521	2	1945	823	766	43	5
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Totals:				35147	13250	9738	3027	400	43

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City	Census Tract ID	Tract People	House Count	Public Water	Drilled Wells	Dug Wells	Other Sources
Douglas	25027 7521	2 1945	823	766	43	5	0
Douglas	25027 7521	1 1438	492	185	290	8	8
	Sub Totals:	3383	1315	951	333	13	8
Grafton	25027 7381	9 437	193	120	63	8	0
Grafton	25027 7381	2 1165	448	419	15	5	0
	Sub Totals:	1602	641	539	78	13	0
Northbridge	25027 7502	6 843	305	271	10	8	0
Northbridge	25027 7502	4 396	137	14	105	12	0
Northbridge	25027 7502	5 245	98	80	14	6	0
Northbridge	25027 7503	1 2841	1018	936	68	14	0
Northbridge	25027 7502	3 1680	734	733	29	7	0
Northbridge	25027 7502	7 1517	494	255	188	38	0
Northbridge	25027 7501	1 810	362	363	6	0	0
Northbridge	25027 7501	2 2753	966	969	9	0	0
Northbridge	25027 7502	8 160	65	63	0	0	0
Northbridge	25027 7502	2 210	65	50	13	0	0
Northbridge	25027 7501	3 1620	669	660	10	0	0
Northbridge	25027 7502	1 296	100	82	0	0	0
	Sub Totals:	13371	5013	4476	452	85	0
Sutton	25027 7511	3 1887	669	214	399	56	6
Sutton	25027 7511	1 648	211	37	159	0	0
Sutton	25027 7511	9 1039	409	17	353	31	9
Sutton	25027 7511	4 2043	734	412	259	40	0
	Sub Totals:	5617	2023	680	1170	127	15
Upton	25027 7431	4 770	298	73	179	39	14
	Sub Totals:	770	298	73	179	39	14
Uxbridge	25027 7492	1 1341	531	508	8	10	0
Uxbridge	25027 7492	2 1435	666	650	0	0	0
Uxbridge	25027 7492	3 2568	970	949	45	0	0
Uxbridge	25027 7491	1 1050	344	39	231	59	0
Uxbridge	25027 7491	2 2590	968	827	160	20	0
Uxbridge	25027 7491	3 572	206	46	128	28	6
Uxbridge	25027 7491	4 848	275	0	243	6	0
	Sub Totals:	10404	3960	3019	815	123	6

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For Radius of 4.2 Mi., Circle Area = 55.417689

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
1	Grafton	25027 73812	1.207793	0.549068	45.46
2	Grafton	25027 73819	1.988224	0.372470	18.73
3	Upton	25027 74314	6.160023	1.853227	30.08
4	Uxbridge	25027 74911	7.069707	6.546824	92.60
5	Uxbridge	25027 74912	6.056848	3.767771	62.21
6	Uxbridge	25027 74913	3.780675	0.007006	0.19
7	Uxbridge	25027 74914	8.469563	0.260923	3.08
8	Uxbridge	25027 74921	0.975539	0.975539	100.00
9	Uxbridge	25027 74922	1.147127	1.147127	100.00
10	Uxbridge	25027 74923	1.627930	1.627930	100.00
11	Northbridge	25027 75011	1.211531	1.211531	100.00
12	Northbridge	25027 75012	0.847533	0.847533	100.00
13	Douglas	25027 75212	3.486834	3.486834	100.00
14	Northbridge	25027 75021	0.322989	0.322989	100.00
15	Northbridge	25027 75022	0.259018	0.259018	100.00
16	Northbridge	25027 75023	1.998448	1.998448	100.00
17	Northbridge	25027 75024	3.645563	3.622470	99.37
18	Northbridge	25027 75025	0.216221	0.216221	100.00
19	Northbridge	25027 75026	1.068085	1.068085	100.00
20	Northbridge	25027 75027	4.181686	4.181686	100.00
21	Northbridge	25027 75028	0.133014	0.133014	100.00
22	Northbridge	25027 75031	2.377434	2.377434	100.00
23	Sutton	25027 75111	5.021240	5.021240	100.00
24	Sutton	25027 75113	11.491604	6.860113	59.70
25	Sutton	25027 75114	4.581361	1.574704	34.37
26	Sutton	25027 75119	5.260591	0.610370	11.60
27	Douglas	25027 75211	6.537602	3.221618	49.28
28	Northbridge	25027 75013	1.310465	1.310465	100.00
Totals:			92.434662	55.431660	

For Radius of 3.2 Mi., Circle Area = 32.169910

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
4	Uxbridge	25027 74911	7.069707	4.738510	67.03
5	Uxbridge	25027 74912	6.056848	0.455715	7.52
8	Uxbridge	25027 74921	0.975539	0.975539	100.00
9	Uxbridge	25027 74922	1.147127	0.881139	76.81
10	Uxbridge	25027 74923	1.627930	1.110066	68.19
11	Northbridge	25027 75011	1.211531	1.211531	100.00
12	Northbridge	25027 75012	0.847533	0.847533	100.00
13	Douglas	25027 75212	3.486834	2.169943	62.23
14	Northbridge	25027 75021	0.322989	0.322989	100.00
15	Northbridge	25027 75022	0.259018	0.259018	100.00
16	Northbridge	25027 75023	1.998448	1.998448	100.00
17	Northbridge	25027 75024	3.645563	2.056643	56.41
18	Northbridge	25027 75025	0.216221	0.216221	100.00
19	Northbridge	25027 75026	1.068085	1.068085	100.00
20	Northbridge	25027 75027	4.181686	3.294517	78.78

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21 Northbridge	25027 75028	0.133014	0.133014	100.00
22 Northbridge	25027 75031	2.377434	1.012411	42.58
23 Sutton	25027 75111	5.021240	3.697636	73.64
24 Sutton	25027 75113	11.491604	3.828112	33.31
25 Sutton	25027 75114	4.581361	0.011999	0.26
27 Douglas	25027 75211	6.537602	0.570373	8.72
28 Northbridge	25027 75013	1.310465	1.310465	100.00
Totals:		65.567780	32.169907	

For Radius of 2.2 Mi., Circle Area = 15.205309

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
4	Uxbridge	25027 74911	7.069707	2.998816	42.42
8	Uxbridge	25027 74921	0.975539	0.648081	66.43
9	Uxbridge	25027 74922	1.147127	0.008734	0.76
10	Uxbridge	25027 74923	1.627930	0.061078	3.75
11	Northbridge	25027 75011	1.211531	1.211531	100.00
12	Northbridge	25027 75012	0.847533	0.847533	100.00
13	Douglas	25027 75212	3.486834	0.413768	11.87
14	Northbridge	25027 75021	0.322989	0.322989	100.00
15	Northbridge	25027 75022	0.259018	0.259018	100.00
16	Northbridge	25027 75023	1.998448	1.682856	84.21
18	Northbridge	25027 75025	0.216221	0.001428	0.66
19	Northbridge	25027 75026	1.068085	0.789950	73.96
20	Northbridge	25027 75027	4.181686	1.706706	40.81
21	Northbridge	25027 75028	0.133014	0.133014	100.00
22	Northbridge	25027 75031	2.377434	0.032312	1.36
23	Sutton	25027 75111	5.021240	1.067426	21.26
24	Sutton	25027 75113	11.491604	1.749390	15.22
28	Northbridge	25027 75013	1.310465	1.310465	100.00
Totals:		44.746403	15.245095		

For Radius of 1.2 Mi., Circle Area = 4.523894

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
4	Uxbridge	25027 74911	7.069707	0.719410	10.18
11	Northbridge	25027 75011	1.211531	0.633738	52.31
12	Northbridge	25027 75012	0.847533	0.847533	100.00
14	Northbridge	25027 75021	0.322989	0.322989	100.00
15	Northbridge	25027 75022	0.259018	0.127122	49.08
16	Northbridge	25027 75023	1.998448	0.080216	4.01
20	Northbridge	25027 75027	4.181686	0.204213	4.88
23	Sutton	25027 75111	5.021240	0.058372	1.16
24	Sutton	25027 75113	11.491604	0.370608	3.23
28	Northbridge	25027 75013	1.310465	1.159692	88.49
Totals:		33.714222	4.523894		

For Radius of .7 Mi., Circle Area = 1.539380

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No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
4	Uxbridge	25027 74911	7.069707	0.081330	1.15
11	Northbridge	25027 75011	1.211531	0.111355	9.19
12	Northbridge	25027 75012	0.847533	0.520365	61.40
14	Northbridge	25027 75021	0.322989	0.024550	7.60
24	Sutton	25027 75113	11.491604	0.105040	0.91
28	Northbridge	25027 75013	1.310465	0.696741	53.17
Totals:			22.253828	1.539380	

For Radius of .45 Mi., Circle Area = 0.636172

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
12	Northbridge	25027 75012	0.847533	0.269125	31.75
28	Northbridge	25027 75013	1.310465	0.367047	28.01
Totals:			2.157999	0.636172	

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===== Site Data =====

Population:	27417.18
Households:	10413.74
Drilled Wells:	1611.06
Dug Wells:	237.46
Other Water Sources:	12.79

===== Partial (RING) data =====

---- Within Ring: 4.2 Mile(s) and 3.2 Mile(s) ----

Population:	8631.79
Households:	3207.09
Drilled Wells:	775.45
Dug Wells:	100.17
Other Water Sources:	10.09

** Population On Private Wells: 2356.72

---- Within Ring: 3.2 Mile(s) and 2.2 Mile(s) ----

Population:	8139.49
Households:	3135.39
Drilled Wells:	483.41
Dug Wells:	68.95
Other Water Sources:	1.78

** Population On Private Wells: 1433.93

---- Within Ring: 2.2 Mile(s) and 1.2 Mile(s) ----

Population:	5319.77
Households:	2079.36
Drilled Wells:	276.26
Dug Wells:	58.39
Other Water Sources:	0.72

** Population On Private Wells: 856.16

---- Within Ring: 1.2 Mile(s) and .7 Mile(s) ----

Population:	2648.27
Households:	992.17
Drilled Wells:	58.24
Dug Wells:	8.76
Other Water Sources:	0.14

** Population On Private Wells: 178.82

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----- Within Ring: .7 Mile(s) and .45 Mile(s) -----

Population:	1349.93
Households:	505.61
Drilled Wells:	12.04
Dug Wells:	1.19
Other Water Sources:	0.05

** Population On Private Wells: 35.32

----- Within Ring: .45 Mile(s) and 0 Mile(s) -----

Population:	1327.93
Households:	494.12
Drilled Wells:	5.66
Dug Wells:	0.00
Other Water Sources:	0.00

** Population On Private Wells: 15.21